ACRP

REPORT 5

AIRPORT COOPERATIVE RESEARCH PROGRAM

Sponsored by the Federal Aviation Administration

Quarantine Facilities for Arriving Air Travelers: Identification of Planning Needs and Costs

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AIRPORT COOPERATIVE RESEARCH PROGRAM

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Quarantine Facilities for Arriving Air Travelers: Identification of Planning Needs and Costs

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WASHINGTON, D.C.
2008
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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), and the Air Transport Association (ATA) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Research problem statements for the ACRP are solicited periodically but may be submitted to the TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

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ACRP REPORT 5

Project 11-02/Task 5
ISSN 1935-9802
ISBN: 978-0-309-09940-0
Library of Congress Control Number 2008904485

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AIRPORT COOPERATIVE RESEARCH PROGRAM

are available from:

Transportation Research Board
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Printed in the United States of America

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FOREWORD

By S.A. Parker
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ACRP Report 5: Quarantine Facilities for Arriving Air Travelers: Identification of Planning Needs and Costs, discusses facility issues, security considerations, and estimated costs (including operating costs) that would need to be considered by airport operators and policymakers in planning for the potential quarantine of arriving air travelers. The physical requirements of setting up a quarantine area are established along with an estimation of the costs for operations and then for recovery. Planning considerations for the diverse needs of a population of 200 travelers are incorporated as part of the standard of care addressed in this report.

This report presents the results of a study of the costs and considerations for establishing a quarantine facility at a U.S. international airport. The laws that govern quarantine and the nine diseases for which the federal government can order quarantine are addressed, along with examples of symptoms and incubation times. The physical requirements of space, privacy, communications, food, water, and sanitary conditions are discussed. Operational considerations are described in the form of a standard of care to illustrate many of the issues that could develop if a diverse group of travelers was required to live together in close proximity under medical surveillance. Finally, estimates of the costs for an airport to establish a facility for quarantining up to 200 people for a maximum of 2 weeks are itemized.

Quarantine laws have a long history in the United States; in 1796, the 4th Congress passed legislation authorizing the executive branch to provide assistance to states in enforcing state health laws. Federal, state, and local governments all have the power to order and enforce quarantines. The Public Health Service Act of 1944, as amended (codified at 42USC201) authorizes the "apprehension, detention, or conditional release of individuals" for the purpose of preventing the introduction, transmission, or spread of communicable diseases specified by Executive Orders of the President.

Under Executive Order 13295, Revised List of Quarantinable Communicable Diseases (issued April 4, 2003), the federal government can declare quarantine for persons suspected of being ill with the following diseases: (1) cholera, (2) diphtheria, (3) infectious tuberculosis, (4) plague, (5) smallpox, (6) yellow fever, (7) viral hemorrhagic fevers, (8) SARS (Severe Acute Respiratory Syndrome), and (9) influenza, from a novel or re-emergent source.

The Tri-Data (a division of System Planning Corporation) Center for Public Protection prepared this report for TRB under ACRP Project 11-02/Task 5. ACRP has the following related works in progress:

- ACRP Project 05-01, "Regionally-Coordinated Airport Emergency Plans for CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosive) Events," and

- ACRP Project 04-04, "Exercising Command-Level Decision Making for Critical Incidents at Airports."

Readers are advised to access capsule descriptions and links to a variety of emergency management, infrastructure protection, and security-related items published by TRB at www.TRB.org/SecurityPubs.

CONTENTS

SUMMARY

Quarantine Facilities for Arriving Air Travelers: Identification of Planning Needs and Costs

Threats to public health are a concern to the air travel industry for many reasons, not the least of which is the potential for air travelers to be ill with one of nine communicable diseases that could require quarantine at or near an airport.

The threat of pandemic flu and the specter of terrorists using pathogens as a weapon have mobilized many government and defense agencies which are addressing how to detect and contain the spread of potentially deadly illnesses to the general public. Since one of the most effective means of controlling communicable diseases is to reduce the exposure of healthy individuals to persons who have the illness, the subject of quarantine has surfaced as a critical tool to be employed when necessary.

The Airport Cooperative Research Program sponsored research undertaken by TriData the division of System Planning Corporation into what would be necessary to effectively quarantine up to 200 travelers from an international flight for 2 weeks, and how much it might cost. This study also presents information on the nature of quarantine and the laws that authorize this form of medical surveillance.

There are four phases of quarantine: (1) the decision to quarantine, (2) establishing quarantine, (3) quarantine operations, and (4) demobilization (including recovery). For this study, quarantine at an airport facility away from the main terminal was the premise on which a range of costs was estimated. These costs include the price for stand-by readiness, the costs of activating the site, the financial requirements attendant to operating a quarantine for 2 weeks, and recovery or demobilization costs. Each of these is described in terms of the specific services, supplies, and some of the infrastructure that would be needed.

The research revealed that the estimated cost to acquire and maintain basic supplies would be over $100,000. In addition, the value of the space that would be needed might cost about $15,000 per month, though this figure would vary widely given market conditions and location. Once a quarantine is ordered, the costs to activate it (setting up accommodations, renting showers, portable toilets, adding telephone lines, and so forth) could run another $20,000 more. The biggest price tag would apply to the round-the-clock operation of lodging, food, recreation, communications, sanitation, basic health services, security, and cleaning which was estimated to be almost $150,000 for the duration of the quarantine. Closing out the site and managing the records would add another $5,000 (conservatively) to the cost. In round figures, then, a quarantine established under the parameters of this study could cost over a quarter of a million dollars. This figure does not include stand-by costs of approximately $15,000/month for an indefinite period, representing the value of the space, which could easily dwarf all other costs.

CHAPTER 1

Background

Introduction

This report discusses facility issues, security considerations, and estimated costs, including operating costs, that would need to be considered by airport operators and policymakers in determining how to plan for the potential quarantine of arriving air travelers, whether facilities for this purpose should be located on airport property, and who should bear the cost of providing such facilities. The physical requirements of setting up a quarantine area are established along with an estimation of the costs for operations and then for recovery. Planning considerations for the diverse needs of a population of 200 travelers are incorporated as part of the standard of care addressed in this report.

This report also includes the following information:

- A bibliography of research for existing quarantine studies and potential applications
- Background information on quarantine laws
- Locations of Federal Quarantine Stations
- Listing and describing the diseases that qualify for quarantine under Executive Orders
- A literature review and bibliography of related publications
- Information needed for airport quarantine site identification and support
- Labor requirements for quarantine operations
- Information on costs, standards of care, planning considerations, and physical accommodations

What Is Quarantine?

According to the Centers for Disease Control and Prevention (CDC), quarantine is the "separation and restriction of movement of persons, who, while not yet ill, have been exposed to an infectious agent and therefore may become infectious." Quarantine is effective in preventing the spread of a contagious illness and can be carried out voluntarily or ordered by government public health authorities.

Isolation is different from quarantine, though many people wrongly use the terms interchangeably. Isolation, as defined by the CDC, applies to people who have a specific infectious illness. Their movements are restricted and they are separated from individuals who are healthy (or at least not symptomatic yet). Someone in isolation may be cared for at home, in hospitals, or at another healthcare facility. Though almost always voluntary, isolation can be mandated by the federal, state, or local government in order to protect the public from disease. For example, a person arriving at an international airport who is exhibiting symptoms of one of nine designated diseases may be taken to an offsite medical facility for treatment and isolation. The remainder of the passengers and crew may then be quarantined to ensure that they do not, in turn, become symptomatic and spread the disease.

Here is an explanation about the terms "infectious" and "communicable": an infectious disease is caused by a virus or bacteria that enters the body through one of a number of different transmission modes. For example, harmful bacteria could be present in food that is eaten and which then causes "food poisoning." A communicable disease is an infectious illness that is spread from one person to another. For example, inhalation anthrax (as used in the 2001 terrorist attacks) is an infectious disease but is not communicable. Smallpox, on the other hand, is both infectious and communicable because it is spread from person to person.

Laws Related to Quarantine

Quarantine laws have a long history in this country. In 1796 the 4th Congress passed legislation authorizing the executive branch to provide assistance to states in enforcing state health laws.[1] Federal, state, and local government all have the power to order and enforce quarantine. Federal

[1] CRS Report for Congress, "Federal and State Quarantine and Isolation Authority" Library of Congress, August 16, 2006 page 3.

authority derives from the U.S. Constitution, which provides that "Congress shall have the power to regulate commerce with foreign nations and among the several states." This is the basis of the Public Health Service Act, which authorizes the Surgeon General "to make and enforce such regulations as in his judgment are necessary to prevent the introduction, transmission, or spread of communicable diseases from foreign countries into the States or possessions, or from one State or possession into any other State or possession."

The Public Health Service Act also authorizes the "apprehension, detention, or conditional release of individuals" for the purpose of preventing the introduction, transmission, or spread of communicable diseases specified by Executive Orders of the President. Under Executive Order 13295 the federal government currently can declare quarantine for persons suspected of being ill with the following diseases:

1. Cholera
2. Diphtheria
3. Infectious Tuberculosis
4. Plague
5. Smallpox
6. Yellow Fever
7. Viral Hemorrhagic Fevers
8. SARS (Severe Acute Respiratory Syndrome)
9. Influenza, from a novel or re-emergent source

A detailed description of these communicable diseases, including their respective symptoms, incubation period, mode of transmission, and methods of diagnosis can be found in Appendix A. The types of diseases on the list can be amended in response to emerging diseases. For example, in 2003, SARS was added, and, more recently, influenza that has the potential to trigger a pandemic joined the list. Other illness such as mumps, measles and chicken pox, while contagious and recognized as serious public health threats, are not listed as quarantinable in the Executive Order. Other federal regulations, such as the airline reporting requirement discussed below, may apply to these diseases and state or local laws may exceed the federal requirements and require different actions, but the nine diseases listed in the Executive Order are the only ones under which the federal government can order a quarantine.

State and local governments have the authority to undertake quarantine measures per their "police powers" to protect the welfare of their citizens, including managing outbreaks of communicable diseases. This authority, which derives from the inherent sovereignty of governments, was recognized in the 10th Amendment to the U.S. Constitution that reserves powers not specifically granted to the federal government to the state government. Some states require court orders before quarantine is permitted while others may limit quarantine to a single disease. The length of time for quarantine may also differ from state to state.

Travelers crossing state or international borders may be legally detained and isolated for purposes of preventing the spread of a quarantinable disease under the provisions of state law and the Public Health Service Act. International travelers, including U.S. citizens, are under federal authority and control and must go through a federal clearance process before they re-enter the country. The CDC can issue a federal isolation order to keep a person under their observation. Law enforcement officers can assist in the detention of the person(s) to permit health officials to make an assessment. Local and state law enforcement officers have similar authority to enforce local health codes or public health orders. Neither the federal government nor any state has issued an enforceable quarantine in the past 50 years.

In November 2005, CDC proposed new regulations that would allow CDC to order a "provisional quarantine," lasting up to 3 business days. The proposed regulations would give CDC time to determine if the suspected disease was present. Lab tests are required to confirm the diseases and generally that takes 3 working days. If more time was needed or if lab tests came back positive for one of the quarantinable illnesses listed above, a formal quarantine order would be issued by state authorities.

It is unclear at this time whether the federal or state government would have primary authority to quarantine air travelers on a domestic flight (i.e., entirely within the United States). Therefore, for planning purposes, this report assumes that the arriving flight subject to quarantine would be an international flight (i.e., originating outside the United States) which would be clearly under the primary authority of the federal government.

Federal Quarantine Stations

The CDC, through its Division of Global Migration and Quarantine (DGMQ) operates quarantine stations at 19 airports and one land crossing (El Paso, TX). These airports are the following:

- Anchorage
- Atlanta
- Boston
- Chicago
- Dallas/Ft. Worth
- Detroit
- Honolulu
- Houston
- Los Angeles
- Miami
- Minneapolis
- New York (JFK)
- Newark
- Philadelphia

- San Diego
- San Francisco
- San Juan
- Seattle
- Washington, D.C. (Dulles)

Each CDC Quarantine Station is responsible for all of the ports of entry in their assigned region. Therefore, these 20 stations cover all 130 of the international airports in this country. Customs and Border Protection (CBP) agents are the lead federal agents at international airports that do not have a CDC Quarantine Station. Appendix B provides a listing of the airports served by the CDC Quarantine Stations and includes contact information.

A CDC Quarantine Station is not a large quarantine facility in the classic sense of a place where scores or hundreds of people are screened and detained, like Philadelphia's Lazaretto, San Francisco's Angel Island, or New York City's infamous "contagion facility" on North Brother Island (arriving ships in 19th century New York City were screened at a quarantine station off Staten Island; only those with nonquarantinable diseases on board were permitted to go to Ellis Island). A "Q Station," as they are sometimes called today, is more likely to be an office space housing a small staff, perhaps with an examining room and facilities to accommodate one or two people held for observation for short periods. These facilities are provided by the airport at no charge to the federal government under the same law that requires airports to provide space for customs and other federal inspection facilities.

A CDC Quarantine Station is staffed during the working day by one to seven CDC employees (or full time equivalents). The Officer in Charge (OIC) is a Senior Public Health Advisor who supervises the activities of the station. The Quarantine Medical Officer (QMO) assists the OIC and is lead medical consultant. The remainder of the staff is classified as Quarantine Public Health Officers (QPHO). Contractors, researchers and other employees may supplement this staff. The typical staff total ranges from four to ten people. During off duty hours, each quarantine station has a 24-hour on-call service and can be contacted directly, in addition any quarantine station, and the Quarantine and Border Health Services Duty Officer at CDC-HQ can be contacted 24/7 through the CDC's Emergency Operations Center.

Role of State and Local Health Departments

Most of the international airports in this country do not have a CDC Quarantine Station on the premises. If a flight arrives at one of these airports with a potential case of a quarantinable disease on board, CDC may ask the local health department, whether it is a state or municipal entity, to evaluate a sick passenger or crewmember and take the lead in the response until a CDC official arrives. The CDC looks upon the relationship between the federal and local health agencies as a partnership, and each of the CDC Quarantine Stations is responsible for developing strong ties to the local and state public health and medical community.

The relationship between state and federal authorities is in flux and is ambiguous under current law. In its proposed regulations, the CDC envisions turning over responsibility to a local health department at some point in the quarantine process. In current practice, CDC works closely with state and local agencies to identify air travelers who may have been exposed to a communicable disease and follow up with them regarding possible treatment.

CHAPTER 2

Phases of Quarantine

Quarantine can be broken down into a series of sequential actions or phases: (1) the decision process to quarantine, (2) the establishment of a quarantine area with registration and assessment of the population going into quarantine, (3) the operational aspects of maintaining quarantine, (4) demobilization, and (5) recovery. This section will discuss each of the phases and identify areas for further study.

Phase 1. Decision to Quarantine

What situation would require a quarantine action at an airport? There are several scenarios that could initiate a quarantine action, but many of the procedures for carrying that out are undergoing revision or under development. The following procedures provide a general idea of how a quarantine might proceed.

CDC could receive a report of a potentially quarantinable disease on board an aircraft in flight. The airline, in particular the captain or person in command of an international flight landing in the United States, is required under federal law (42 CFR 71.21) to report illness meeting certain criteria to a CDC Quarantine Station. Notification can be done via the air carrier's operations center or through air traffic control. (A separate regulation found at 42 CFR 70.4 applies to flights within the United States). The criteria for an "ill person" as defined by the regulation are:

- A fever, defined as a temperature of 38°C or 100°F or greater, accompanied by one or more of the following: rash, jaundice, glandular swelling, or temperature persisting for two or more days.

  and/or

- Diarrhea severe enough to interfere with normal activity or work (defined as three or more loose stools within 24 hours or a greater than normal number of loose stools).

Any traveler(s) who meets the criteria would be assessed by a public health official, as well as by airline medical consultants or by airport emergency medical personnel who would determine if the traveler required medical treatment. Nearly all airlines have in-house medical personnel or a contract with a service to provide medical advice on the ground to the aircraft crew handling an in-flight medical incident. These medical professionals may also be able to coordinate with the CDC Quarantine Station personnel or other public health officials by providing them with additional information prior to landing that would expedite assessment of the traveler.

Generally, the arriving aircraft would proceed to its assigned gate at the scheduled airport, where it would be met by public health officials and the airport emergency medical response team. If a preliminary assessment identified the potential for a quarantinable illness on board, the aircraft might be directed to a more remote area of the airport or to a gate closer to the CDC Quarantine Station. The plane may even be diverted to another airport. The decision would be made by federal authorities, with CDC taking the lead.

If the airline does not identify and report a potential communicable disease in flight but requests medical assistance upon landing, the airport medical emergency response team may determine that the situation involves a potential quarantinable illness and the CDC Quarantine Station covering that airport would arrange for further assessment by CDC personnel or by local public health officials. In such circumstances, other passengers and crew members may be requested to provide contact information for possible follow-up or to remain on the aircraft or in the gate area until their status is determined.

CDC may opt to have Quarantine Station personnel meet flights that have originated or stopped over in a country or region where an outbreak of a communicable disease is known to be occurring. CDC has the authority to observe and interview passengers as they leave the aircraft.

Regardless of how the process is initiated, the decision to impose a quarantine order on international travelers arriving

in the United States lies with the CDC; this is not an airport or air carrier decision. The air carrier has a duty to report certain illnesses as explained, but for international travelers, only federal public health officials are legally authorized to implement a quarantine.

While CDC has the *authority* to impose mandatory quarantine for nine diseases, the agency may choose a less extreme measure such as voluntary home quarantine; prophylactic treatment where available (e.g., vaccination); or simply collection of contact information and follow-up by public health officials to determine if anyone exposed develops symptoms later. The latter was done during the 2003 SARS outbreak.

Phase 2. Establishment of Quarantine

After the decision to quarantine is made by the CDC, the next step is to determine where the quarantined passengers and aircrew would be held and to set up the necessary accommodations. Health officials will decide if the ill person(s) and any others exhibiting symptoms should be referred to a hospital or other medical facility for treatment and isolation. Others exposed to the illness, though not symptomatic, may need to be detained for hours, days, or even weeks until a diagnosis is confirmed, the time period for incubation is determined, and the risk of further spread of the disease is evaluated. For example, exposed individuals may need to be kept in quarantine until laboratory tests confirm the initial diagnosis. If tests are negative, individuals would then be released from quarantine. If the tests prove positive, quarantine would be extended for the appropriate incubation period. An estimate of these time frames and decision points should be made and conveyed to passengers and crew at this point and then updated as needed.

Keeping passengers and crew on board the aircraft or in the gate area for any extended period is not desirable and may not be feasible; therefore, it probably will be necessary to remove quarantined individuals to another location on or off the airport. A procedure for transport to the designated medical surveillance area should be made part of an airport's emergency plan. If the facility is on the airport property but away from the terminal, the aircraft may be able to be moved to that facility and a stairway provided for egress from the aircraft. Lift service would need to be available for nonambulatory or limited ambulatory passengers, and wheelchairs should be available.

If the quarantine site is off the airport property or otherwise not accessible by moving the aircraft, other vehicles, like buses or airport shuttles, would have to transfer the passengers and crew to the site. In this case, officials would have to consider the personal protection of the vehicle operators. Later, the vehicles would need to be decontaminated. In some situations, one facility may be used to screen and register individuals who could then be transported to longer-term accommodations.

The passengers and crew of the aircraft would be interviewed to collect basic information and evaluated to assess potential exposure. Medical personnel also would access any pre-existing health issues that may exacerbate, complicate, or confound symptoms of the quarantinable disease (e.g., pre-existing respiratory or cardiac conditions that might be worsened or triggered, or seasonal allergies that might be mistaken for or mask symptoms of the quarantinable disease). The stress of being quarantined may exacerbate existing conditions and travelers may have medication needs.

Phase 3. Quarantine Operations

Once a quarantine location is established and quarantined individuals have been transported there, the site becomes operational. The individuals under quarantine will need food, water, toilet facilities and, depending on the duration of the quarantine, accommodations for sleeping, bathing, entertainment, and communications. Access to medical care will have to be available. Supplies and staffing for food preparation, medical care, security, cleaning, counseling and so forth will have to be mobilized quickly. Personnel from many different agencies could be involved in the effort, including CDC officials, state and local public health employees, hospitals, airport and airline staff, private sector contractors, local public safety officials, and non-profit organizations.

It will be very important to maintain good records on the individuals who are held in quarantine. Also, the operation will require rapid acquisition of goods and services, many of which ultimately may be reimbursable from disaster response funds or other sources. To take advantage of those resources, and for general accountability, it will be necessary to have records of all purchases and receipts. Totals can be organized and tallied during demobilization after quarantine ends. Record keeping is vital in the event of any legal claims and in preparation for cost reimbursement.

An important area for further study is to examine and compare specific mandates of federal, state, and local government with an eye toward determining more precisely the responsibilities of each and how the cost should be allocated.

Phase 4. Demobilization

Plans for demobilization can begin immediately after quarantine is underway. A demobilization plan—the controlled, organized cessation of operations—is a feature of the National Incident Management System (NIMS). The plan should include procedures for finalizing all records, including financial records. Having a system in place helps to reduce the potential for confusion on billing for rented equipment and per-

sonnel costs. Documentation of medical conditions that may have developed during the quarantine should be part of the records management planning. A demobilization plan should cover the following items in depth:

- Final medical checkout of detainees by medical staff
- Planned release times for travelers and crew
- Coordination with air carrier for travelers to finish their journey if additional flights are needed
- Ground transportation to the destination of choice for travelers if needed
- Shutdown of service items such as food delivery, trash pickup and so forth
- Documentation of all costs incurred by the operation
- Any logs, reports or diaries of the course of the quarantine have to be collected and collated
- Critical Incident Stress Management intervention for personnel held in quarantine and those supporting the operation off-site
- Final press releases
- Clean-up and recovery plans

Phase 5. Recovery

Recovery can be defined as the restoration of services and the environment to the state they were in prior to the event. In the case of quarantine at an airport, it would address the restoration of the space used for the quarantine. The aircraft that carried the passengers to the airport could be decontaminated and disinfected as soon as the passengers, crew and baggage are removed. However, if it is suspected that the incident was deliberate, the plane would be off limits until it was released by the appropriate law enforcement agency involved in the investigation.

Aircraft, equipment, and space clean up require specific cleaning and clearance procedures depending on the characteristics of the biological agent involved. The work will need to done by specially trained personnel and equipment. Vehicles and equipment, such as buses, carts, wheelchairs, and so forth, also will need to be cleaned to a level where they are considered safe to return to service. Equipment that can not be cleaned to required standards would have to be disposed of and those costs would have to be covered.

The costs of clean up will vary according to the type of disease involved. Some disease-causing pathogens can be deactivated through procedures consisting of fairly simple cleaning with a standard disinfectant. Others may require more expensive and time-consuming procedures. It should be noted that none of the quarantinable diseases would be likely to require the type of intensive decontamination process required to deactivate anthrax spores, which are hardy and extremely persistent in the environment.

The potential psychological effects of quarantine on an airport and its employees have not been studied, but it is certain that workers in and around the airport will require reassurance that their work area is safe and their health will not be endangered. Part of the demobilization and recovery is preparing the staff to return to routine duties.

CHAPTER 3

Planning Considerations for Airport Quarantine

There are several unique planning features associated with quarantine of the crew and passengers of a commercial aircraft arriving in the United States. *The National Aviation Resources Manual for Quarantinable Diseases* identifies nine considerations for planning in the event that quarantine is needed. That manual recommends the following be addressed in the planning process:

1. Identifying a secure location and requisite lodging for quarantine. (Space must be adequate and safe).
2. Identifying the staff needed to sustain, enforce, and provide services to quarantined individuals and from where this staff will come. (Food, water, and sanitation are among the basics).
3. Identifying the supplies needed to sustain quarantine and from where these supplies will come.
4. Identifying the medical and mental health needs of the quarantined population and how these needs will be met. (Physical and emotional support may be needed).
5. Identifying the special needs of the quarantined population (e.g., children, pregnant women, people with disabilities, and differing cultures and religions) and how these needs will be met.
6. Identifying the support organizations available to assist in managing quarantine.
7. Identifying the financial needs for managing quarantine.
8. Addressing the legal needs for managing quarantine (e.g., due process protections for quarantined passengers and flight crew).
9. Addressing media and public information issues [e.g., setting up a Joint Information Center (JIC)].[2]

This report addresses the planning considerations specific to an airport quarantine site and the estimated associated costs. For purposes of this analysis, it is assumed that quarantine of 200 people for up to 2 weeks would be established on property owned or controlled by the airport and away from the terminal. This is not the only potential location where a quarantine facility could be established and operated. At least two other possible scenarios—quarantine within the airport terminal and an off-site quarantine facility—should be investigated further. The following analysis identifies the major anticipated costs but makes no assumptions or judgments about who would be responsible for them.

There are no assumptions made about who would be responsible for all the associated costs of quarantine under these circumstances. This report identifies the major anticipated costs without regard for who would pick up the tab. In reality, costs would be spread among various entities depending on who is liable for covering what costs.

Location

There are several possible locations on airport property for establishing a quarantine facility, each of which would present its own challenges. The options include dedicating an existing facility to this purpose such as an unused hangar; identifying a facility used for another purpose that could be shifted to use as a quarantine area (e.g., a portion of a terminal building); or determining a site on which temporary facilities could be erected. Trailers, tents, or other types of emergency shelter might be feasible depending on the time of year and the weather. Determining the optimum location from an operational and cost standpoint will depend on the specifics of the airport, but the following factors should be considered.

Space Requirements

How much space is needed to sustain quarantine for as many as 200 people for up to 14 days? If quarantine is considered a form of "medical sheltering" to protect a community

[2] National Aviation Resource Manual for Quarantinable Diseases, U.S. Department of Transportation, December 2006.

from the spread of disease, then shelter models can be applied. FEMA guidance for hurricanes (and any event of less than 36 hours duration) is a mere 10 square feet per person. Standards for longer stays are double or triple that number. Thus, at least 4,000 ft^2 of space would be needed for personal space at a quarantine site. That amount does not include the space required for eating, recreation, offices, or ancillary services.

Transport to the Facility

If the site is not directly accessible from the aircraft (either via a jet bridge to the terminal or via mobile stairs from a remote parking location), the quarantine plan must include provisions for the movement of the passengers and crew. If motor vehicles such as buses are used, this may involve quarantine of the operators and the decontamination of the vehicles.

Security

People being held in quarantine must be protected from harm, and their personal belongings (including luggage, if returned to them) must be secure as well. Basic security measures and secure storage need to be provided. A security force must be in place to ensure that the people being quarantined do not leave and that unauthorized people do not enter the facility. Curious people, the press, politicians, and others will not be permitted to come into the area to observe or interview the people inside the quarantine area. Once in the area, a person remains there until released. Perimeter fencing and limited access to the building housing the quarantine area may be required.

Impact on Airport Operations

The location of the facility, and whether it is a multiple-use or dedicated facility, will have a direct impact on airport operations. Intra-airport transportation may need to be re-routed. It is also possible that cordoning off an area could affect aircraft movements on taxiways and ramp areas. Airport managers and their staff would need to establish a Unified Command operation and mobilize their Emergency Operations Center as the coordination site for additional personnel who will handle the media, help manage a family assistance center, provide security, coordinate incoming volunteers, and manage the logistics of outside (private sector and government) assistance.

Accommodations

Power Source

If the building does not have adequate primary and backup power, generators and fuel supplies have to be available to keep the facility operational for the duration of the quarantine. Power requirements will be substantial and will involve more than back-up emergency power to keep exit lights illuminated.

Heating, Ventilation, and Air Conditioning

A quarantine area must have sufficient heating, ventilation, and air conditioning (HVAC) systems to keep people reasonably comfortable. This is more than just for convenience: the old, the very young, and people with particular medical conditions are less tolerant of temperature extremes than the rest of the population. Portable HVAC units may have to be brought to the quarantine site, and ventilation will have to be evaluated by an HVAC expert.

Lighting

The building must have adequate lighting for daytime and nighttime use. Depending on how the building is used normally, sufficient lighting may already be in place, although it may not provide adequate task light or allow for lower lighting levels during the evening.

Sanitation

The sanitary needs of a group of people under quarantine must be addressed. In all likelihood, the building will not have enough toilets for 200 people. The structure or area may not have any facilities for bathing (showers). Between four to five (in-place or portable) toilets are recommended per 100 occupants. For 200 people then, a minimum of 8 and preferably 10 toilets would be needed. One ADA-approved handicapped toilet also would be required. If the toilets are portable, plans must include pump out and cleaning. Depending on the facility being used, portable sinks might also need to be provided.

Unless the quarantine is of very short duration, (e.g., less than 24 hours), showers will have to be provided. Also, for a quarantine of up to two weeks, provisions must include laundry service. Given the circumstances, an off-site service may not be feasible. As an alternative, several washer/dryer units could be pre-deployed in a designated area.

Communications

Quarantine planners will need to ensure that the site can be set up with communications links (telephone lines, internet, television, public address system) either through pre-established infrastructure or via wireless capability. Radios, batteries, and power outlets for cell phone recharging will be needed.

Animals

Some travelers may arrive with pets or service animals (service animals such as guide dogs are not considered pets and are

exempt from most restrictions on travel with pets). Pet dogs and cats are subject to inspection upon arrival in the United States for evidence of disease. In addition, dogs arriving from countries where rabies is reported are required to be immunized against rabies. Dogs and cats that appear to be ill with a disease that may be transmissible to humans are subject to veterinary medical examination, treatment, and/or quarantine (see http://www.cdc.gov/ncidod/dq/faq_animal_importation.htm#dogreqs). Service animals are generally allowed in other shelter situations and should be accommodated in a quarantine facility if possible. Careful consideration should be given to allowing pets that are cleared of disease to remain or be reunited with their owners. Allowing pets to be co-located with their owners (instead of housed at an animal shelter or elsewhere on the airport) may provide comfort and psychological support. However, other quarantined individuals may have allergies or aversions to animals, and the noise, mess, and smell associated with some pets may be hard to control in a shelter setting.

Supplies

Food and Water

Food and water are crucial to the operation of a quarantine area. A quarantine plan should include provisions to store a supply of basic foods or to acquire them quickly, for the first 24–48 hours of the quarantine. After that point, if necessary, a food supply system should be in place to provide for needs of the people in quarantine.

There may be passengers who have diabetes or other related blood sugar disorders or who are on medication that requires it be taken with food. Also, some travelers may have babies or small children with them. It is much harder for babies and small children to ward off hunger. Space for carbohydrate-rich snacks, baby formula, and canned or packaged food could be provided at the site. It is not necessary to have accommodations for preparing hot meals as long as they can be purchased for delivery from a supplier. Paper plates, cups, and napkins and plastic utensils can be used. Can and bottle openers should be available as well.

The people in quarantine will need water. If the building does not have potable running water, then alternative supplies must be provided. Between a half and 1 gallon of water per day per person may be necessary. Bottled water can be brought in by a public or private supplier or stored on site (or elsewhere on the airport property). If the temperature in the building is warmer than comfortable, then more water may be needed. Other beverages can be provided to supplement water.

Clothing and Personal Items

Depending on the pathogen involved, passengers and crew may not have access to their baggage until it has been decontaminated or disinfected. Even if baggage is immediately available, travelers may not have sufficient clothing and personal items for more than a day or so, or might not have appropriate clothing for the airport climate. Some quarantined individuals may be able to make arrangements for clothing and personal items to be sent to them by family or friends, while others may need to have these provided. Many volunteer organizations have or can quickly obtain donations of clothes.

Bedding and Other Supplies

A projected list of supplies and equipment, per FEMA and Red Cross guidelines, should include the following:

- Bedding—a cot, blanket, pillow and sheets for each person. It is a good idea to have a 10% spare capacity as well.
- Emergency equipment—flashlights, fire extinguishers, tool kits.
- First-aid supplies—tape, safety pins, latex gloves, scissors, antiseptics, antibiotics, smelling salts, splints, thermometers, blood pressure gauges, variety of bandages, towels, and ointments.
- Sanitary supplies—toilet paper, paper towels, personal hygiene items, chlorine bleach, disinfectants, trash cans, and plastic bags.
- Infant and children supplies—disposable diapers, powders and ointments, moistened towelettes, pacifiers, toys, and blankets.
- Social and recreational needs—age-appropriate games, toys, books, and magazines.

A quarantine area should have portable partitions to allow family groups to stay together and to allow at least some privacy for sleeping and changing clothes. In addition, partitions will be needed to establish recreational and office space.

Staffing

The question of staffing the site and providing services requires serious consideration. The quarantine area can not run itself, but how can services be provided if staff will potentially expose themselves to contamination as well? The scope of this study does not allow for a sufficient examination of this question. For the purposes of planning and estimating associated costs, the following assumes that measures will be identified and implemented that minimize the risk of exposure for individuals providing these services (e.g., through the use of personal protective equipment, inoculations and/or prophylactic treatment, and/or strategies for avoiding person-to-person contact). The cost of implementing these exposure minimization measures is not included in this analysis.

Services

Security

Security will be essential and law enforcement personnel are likely to be required. Again, consideration must be given to exposure of security personnel.

Medical Evaluation and Services

Nurses and doctors may be needed to assess quarantined individuals for symptoms of the quarantinable disease as well as to provide evaluation and treatment of pre-existing or newly occurring conditions. The same worker contamination issue as discussed before applies if practitioners are in direct contact with exposed individuals.

Part of the initial assessment process will be to screen the population for existing medical conditions. For example, some people may have chronic conditions that require medical treatment on an ongoing basis (e.g., dialysis every 48 to 72 hours or a continuous supply of supplemental oxygen). Likewise, some people may have daily or frequent medication needs, and may only have enough medications to last for the expected duration of their trip, or may not have immediate access to medication in their checked baggage. Many medications require refrigeration or room temperature storage—if bags are subjected to extreme temperatures the medicine may need to be replaced. A quarantine plan must have provisions for replacing, storing and dispensing prescription medication and other medical treatment unrelated to the quarantinable disease.

Injuries and illness that could occur or develop during quarantine must be treated, too. First aid kits should be part of the inventory of supplies awaiting a group of people being quarantined. In addition, one Automatic External Defibrillator (AED) per 100 people should be available in the quarantine area. Arrangements should be made in advance with local medical facilities for referring people subject to quarantine in the event that more extensive medical treatment is necessary.

In the event that there is an outbreak of the disease that necessitated the quarantine or any other disease, treatment plans and the staff needed to implement them are needed. Isolation areas within the quarantine area may be necessary.

Mental Health

While the majority of the population in quarantine will adjust to the situation, there may be individuals that do not. There may be passengers with pre-existing mental health issues who require additional care. Part of the medical considerations for a quarantine plan must include provisions for mental health services and the well being of the people in virtual lock down. Counseling should be provided and resources made available after the people are released from quarantine. Mental health issues may overlap with medication needs and become part of the needs to acquire and store medications on site.

Special Needs

Language and Cultural Needs

An international flight will probably include individuals from outside the United States who are not fluent in English. This language barrier will cause communication difficulties between quarantine officials and the foreign nationals, and will require the services of interpreters. Quarantined individuals or airport or airline employees with multi-lingual skills may be of assistance in providing interpretation. If no locally-based interpreter is available it may be possible to provide interpreters by phone (note: even on-site interpreters will not be able to have direct contact with the quarantined individuals unless they themselves are quarantined). Embassy contact information should be provided to quarantined foreign nationals.

Dietary Restrictions

Whether based on cultural practices, religious beliefs, or health concerns, some people may require special food. For example, several cultures and religions do not eat pork products. When acquiring pre-packaged meals for the quarantine area, a chicken meal and a vegetarian meal should be two of the choices. After the dietary needs of the population are known, a variety of foods can be ordered.

Religious Needs

As with cultural differences, religious needs have to be addressed in a quarantine plan. An area(s) should be designated as "quiet or meditation" zone(s). Certain faiths may ask for religious books such as a Bible or Quran. Pastors or chaplains or other spiritual leaders may offer or request to be admitted to the area to minister to the needs of the members of their faith.

Media Management

A quarantine at a U.S. airport would attract extensive media coverage. The challenges for the airport public relations staff include handling media inquiries and requests for interviews, managing (or restricting) access for media on site, and coordinating closely with federal, state, and local agencies as well as with airlines to ensure consistent and accurate information is provided to the public.

Under the National Incident Management System (NIMS), a Joint Information Center (JIC) is established and all press briefings are conducted at one time at this designated location. Most airports will have such facilities or locations in place as part of their emergency response plans, but special consideration should be given to its location in a quarantine situation. The JIC must be far enough removed from the quarantine facility to avoid the risk of exposure and protect the privacy of quarantined individuals, while still facilitating coordination with those responsible for managing the quarantine. In a JIC all stakeholder agencies provide coordinated press releases to ensure that consistent and accurate information is released.

It is important during any emergency to convey complex information clearly and simply. However, it should be anticipated that quarantined individuals may contact the media directly via cell phone or e-mail, or be willing to provide interviews to the media without going through any official communications plan. Providing quarantined individuals with access to the same information that is going out to the media will help to address this issue.

Clean-Up and Disinfection (Post-Quarantine)

Before the area that is used for quarantine is returned to other service or left in a stand-by mode for future use as a quarantine facility, it must be cleaned sufficiently to ensure that there is no risk of further contagion from the items or materials left behind. Plans should be made for specialized cleaning/disinfection by individuals trained in the use of appropriate personal protection equipment (PPE) for the quarantinable disease and universal precautions for dealing with materials potentially contaminated by blood and feces.

If the quarantine facility serves another purpose at the airport (e.g., food service), more stringent clean-up standards may be applicable.

CHAPTER 4

Estimated Costs

A major focus of this project was to determine the costs of imposition of quarantine at an airport. We have identified costs for an airport to operate a quarantine area on airport property for 200 people for a period of up to 2 weeks. While many costs are fixed, some operational costs would vary depending on the exact size and composition of the quarantined population and the duration of the quarantine period.

There are several factors that would be airport specific. For example, if a vacant hanger is used, a determination must be made if airport owners are still paying for the hanger. If the hanger or other space is under lease to another party, then the costs of losing that income must also be considered as part of the total costs. And, if the building is modified to meet a different building code (e.g., more exits and/or additional bathrooms), this cost must also be considered.

Some of the supplies and equipment listed can be stored on airport property in the building that will be used for the quarantine or in secure storage areas. There will be some maintenance costs to ensure the readiness of these materials. If not stored in the intended building, some form of secure storage, (e.g., pods or trailers) must be considered.

The costs have been organized into four groups: (1) stand-by costs, (2) costs to activate a quarantine, (3) operational costs, and (4) the costs to recover. These cost estimates include most of the major items to be considered, though a larger study could identify others. Costs also would be impacted by the location and nature of the incident and the composition of the population in quarantine. Finally, some of the expenditures are for items that ostensibly could be re-used if ever needed again, especially if no one in quarantine becomes ill with the disease in question. Those costs are marked with an asterisk (*). Other costs are for items that would have to be replaced.

Stand-By Costs

Stand-by costs as shown in Table 1 are the costs related to the value of the space and the cost of utilities, plus the costs of basic quarantine start-up provisions and their storage. Thus, these costs are those that support the availability of a facility and to maintain some supplies in storage for immediate availability. The costs of depreciation of the property and lost revenue if a revenue-generating building is given over to permanent use as a quarantine area are not calculated. The numbers for depreciation and lost revenue are too variable to try to estimate in this study because they depend directly on where the airport is located and the value of the real estate there, the age of the structure, and the routine use of the space potentially earmarked for conversion to a quarantine area.

Activation Costs

These are the costs of opening the facility to incoming passengers and crew for a period of up to 2 weeks. Included in Table 2 are the costs of rental of portable shower trailers and washers and dryers. Trailers take an average of 24–36 hours to be delivered on site and connected to existing water supplies.

Operational Costs

These are the costs as shown in Table 3 that would be incurred for a 14-day quarantine event. The exact composition of the population would change some figures. For example, the authors estimate that there will be the need for three portable cribs for children under the age of two, but that could end up being five or more.

Recovery Costs

These are the costs for cleaning the building and restoring it to its previous use (see Table 4).

Table 1. Total stand-by costs.

1. Cost of Space in a Separate Facility if Used for Quarantine Needed: 20 square feet per person x 200 people = 4,000 square feet 7 additional rooms for: recreation/leisure (3), office area, food assembly and serving, medical, and storage. Each room 500 square feet x 7 = 3,500 square feet. **Total space: 7,500 square feet** Approximately $2.00 per square foot/month x $7,500 = **$15,000 per month**	**Value of the space: $15,000 per month**
2. Privacy Partitions and Space Dividers Partitions needed for sleeping areas—approximately 320 partitions (based on 100 individually divided spaces and 50 other divided spaces occupied by couples or small families). 7 other divided spaces for recreation/leisure (3), office area, food assembly and serving, medical, and storage—approximately 22 (2-3 dividers per space depending if it is on location next to walls or at end of aisles) 342 dividers x $200 each = **$68,400***	**$68,400***
3. Storage Lockers—6 tiered metal lockers (size 1 cu ft.) with 3 for each row (18 individual lockers) x 12 @ $325 each = **$3,900**	**$3,900***
4. Cleaning supplies Commercial mopping combo @ $26.00 x 5 = $130* Mops @ $11 each x 5 = **$55*** Trash cans: 1 44-gallon cans per 20 people plus 1 for each of 7 "other use" spaces and 3 extra = 20 cans x $45 per can = **$900*** Cleaning liquids, approximately 25 gallons x $7.00 per gallon = **$175** Trash can liners @ $1.50 per liner x 20 cans x 14 days = **$420**	**$1,680**
5. Coffee Machines 2 coffee machines ($25 each x 2= $50) per group of 40; 5 groups (of 40 persons) x $50 = **$250**	**$250**
6. Medical Supplies First aid kits—10 kits @ $20 each = **$200** Automatic External Defibrillator (AED) @ $1,245 each x 2 = **$2,490*** Particulate/surgical masks @ $10 per box of 20 x 28 = **$280** Powdered Latex-free gloves @ $3.50 per box of 100 x 5 = $17.50 **($18)**	**$2,988**
7. Toiletries/Bedding 200 cots + 10% spare (20 additional cots) @ $20 each = **$4,400*** 2 sheets per bed @ $10 each x 220 = **$2,200*** Blankets @ $10 each x 220 = **$2,200*** General toiletry items (toothbrush, toothpaste, soap, shampoo, razor, shaving cream, lotion) @ $10 per person x 220 (20 extra) = **$2,200** Towels—240 (200 plus 17% extra) @ $8 per dozen x 20 packs = **$160*** Washcloths—240 (200 plus 17% extra) @ $4 per dozen x 20 packs = **$80*** Flip flops for showers—200 x $2 (sold in cases) = **$400**	**$11,640**
8. Labor (average) Private security to include this building in routine checks (if not otherwise in use and monitored by security) 1 additional man-hour per day @ $30.00 per hour x 30 days = **$900** Or use of Airport Police to include building (non-overtime) 1 additional man-hour per day @ $45.00 per hour x 30 days = **$1,350**	**$1,125**
Total Stand-by Costs	**$104,983**

****Possibly one-time expense; could be re-used.***

Table 2. Total activation costs.

1. Labor ***Building Supervisor*** (prepare area for arrival of individuals in quarantine and for quarantine staff, including set-up, utilities, ordering shower trailers, food and water, sanitation equipment, etc.) 2 personnel for 10 hours each = 20 hours @ $30.00 per hour = **$600**	**$600**
2. Showers 3 shower trailers (14-16 shower stalls) available after 48 hrs of initial quarantine mandate. Includes running water and heat. Shower facilities would be delivered and installed within 2 days. Cost includes delivery and set up to existing water supplies (fresh and waste water). Holding tanks and pump-off costs would be extra if needed.	**$10,000**
3. Washer/Dryers Combo washer-dryer sets @ $1200 x 5 (1 per group of 40 people) = **$6,000***	**$6,000***
4. Portable Toilets Rental of 10 porta-johns @$75 each (per month) = **$750** 1 ADA-approved porta-john @ $125 each (per month) = **$125**	**$875**
5. Portable Sinks Rental of 6 dual sinks (with 45-gallon water container, soap dispenser, and trash receptacle @ $85 each (per month) = **$510**	**$510**
6. Communications Communications (other than TV/DVD/Books): One room (perhaps 10x50 ft) with Internet (5) access, telephones (5): costs	**$1,500**
7. Utility Start-Up Costs This includes the costs of any activation fees for telephone lines, cable service or other contingency services not included in Operational Costs	**$1,000**
Total Activation Costs	**$20,485**

****Possibly one-time expense; could be re-used.***

Table 3. Total operational costs.

1. Labor ***Cleaning*** Two employees for 4 hours per week = 8 hours x 2 weeks = 16 hours @ $18 per hour = **$288** ***Site Management and Administration*** 3 Site Supervisors (24-hour coverage for 14 days = 336 hours x $40/hour = **$13,440** 3 Service Coordinators (24-hour coverage for 14 days = 336 hours x $30/hour = **$10,080** 4 Assistants (to cover 7:00 a.m. to 7:00 p.m. for organizing and serving 3 meals per day and clean up) 2 per 6-hour shift x 2 shifts = 24 hours per day x 14 days = 336 hours @ $18 per hour = **$6,048** Subtotal: **$29,528** ***Security*** Private security at @ $30.00/hour = **$30,240** Or use of Airport Police (non-overtime) @ $45.00 per hour = **$45,360** Average costs of security= $37.50 per hour x 3 personnel x 24 hrs x 14 days = **$37,800**	**$67,656**
2. Cleaning Supplies 1 case (6 ct) of Chlorinated Bleach @ $14 x 2 = $28 12 ct Clorox disinfectant wipes @ $36 x 2 = $72 Disinfectant cleaner 1 gallon each @ $17 x 7=$119 1 case (12 ct) of disinfectant spray @ $76x 7 = $532	**$751**
3. Baby Supplies Diapers, 140 per pack @ $40 each x 3 packs (assorted) = **$120** Baby formula (6 32-oz. cans per pack) @ $30 each x 12 packs* = **$360** Baby food, 5 cases (24 count) @ $30 per case = **$150** Bottles, 5 per baby x 3 babies = 15 bottles x 5 packs (3 ct) @ $8 each = **$40** Pacifiers, 1 pack (2ct) @ $5 each x 3 = **$15** Baby wipes, 6 packs @ $4 per pack = **$24** Portable cribs as needed (one per child < age 2) @ 100.00 each x 3 = **$300** Crib mattresses, 3 @ $35 = **$105** Crib sheets and baby blankets for 3 cribs and 1 change of sheets, **$150** High chairs (3) @ $50 each = **$150**	**$1,414**
4. Food/ Beverages/Supplies ***Meals*** —(combination of hot and cold food) 3 meals per person per day x 200 individuals = 600 meals per day x 14 days = 8,400 meals @ average $6 per meal = **$50,400** ***Beverages*** Bottled water, 4 bottles per person per day x 200 individuals = 800 bottles per day x 14 days = 10,400 bottles @ $1 each = **$11,200** Other beverages (juice, soda, coffee, tea, etc.) approximately 5 per person per day x 200 = 1,000 beverages per day x 14 days = 14,000 beverages @ $0.50 per beverage = **$7,000** ***Food and Beverage Supplies*** Hot/cold drinking cups, @ $23 per case (1,000 count) x 14 = **$322** Paper plates, @ $17 per case (500 count) x 21 = **$357** Plastic utensils, 1 case of assorted utensils (100 count) @ $25 x 3 0= **$750** Paper napkins, @ $3 per pack (100 count) x 88 = **$264** 10 coolers @ $20 each = **$200** 4 bags of 2-lb ice per day for each cooler @ $2 each = $8 per cooler x 10 = $80 per day; $80 x 14 days = **$1,120**	**$71,613**

* Would provide approximately 7 cups of milk per baby for 14 days, assuming 3 babies in quarantine.

Table 3. (Continued).

5. Other Supplies Toilet paper, 1 case (96 count) @ $54 per case x 30 = **$1,620** Paper towels, 1 case (16 count) @ $40 x 25 = **$1,000** Facial tissue, 1 case (12 box count) @ $25 x 16 = **$400** Feminine Products sanitary napkins (100 per case) @ $20 x 4 = **$80** tampons (500 count) @ $61 x 1 = **$61** Flashlights @ $13 x 12 = **$156** Fire extinguisher @ $27 x 2 = **$54** Batteries (for flashlights and radios) **$200** Entertainment Televisions (5) @ $250 x 5 = **$1,250** (or rent for less) DVD players (5) @ $100 x 5 = **$500**(or rent for less) Games (cards, board games, DVD's, compact discs) **$400** Toys, assorted **$300** Radios (4) @ $30 x 4 = **$120**	**$6,141**
Total Operational Costs	**$147,575**

Table 4. Total recovery costs.

Labor ***Cleaning*** Labor for clean up and disinfecting the building. A specialized cleaning company that handles biological hazard clean up may have to be hired. 1 supervisor x 8 hours(2 each day) = 32 hours @ $50 per hour = **$1,600** 3 people x 32 hours each = 96 hours @ $30 hour = **$2,880** ***Building Supervisor*** (oversee management of the building and utilities as regular use returns) 32 hours @ $30 per hour = **$960** ***Site Supervisor*** (finalize records and reports and oversees close out of quarantine operations of items) 40 hours @ $40 per hour = **$1,600** **Total Recovery Costs**	**$7,040**
TOTAL ESTIMATED COSTS FOR QUARANTINE	**$ 280,083**

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APPENDIX A

CDC Disease Quarantines

APPENDIX A. CDC DISEASE QUARANTINES

Disease / References	Symptoms in Early Stage (prodrome stage)	Symptoms for Full Blown Illness (fulminant stage)	Incubation Period (average and range for 95% of cases)	Mechanism of Contagiousness	Method for Diagnosis in Early Stage	Method for Diagnosis during Incubation
Diphtheria 1-4	Malaise, sore throat, loss of appetite, moderate fever, and barking cough.	Adherent, gray membrane forms over the mucous membrane of the tonsils and/or pharynx.	2-5 days (range 1-10 days).	Direct person-to-person transmission by intimate respiratory and physical contact. Cutaneous lesions are important in transmission.	Detection of the lethal and potent toxin produced by the bacteria that causes the disease (*C. diphtheriae)* is the definitive test for making a diagnosis of diphtheria. Also, testing the levels of two enzymes (pyrazinamidase and cystinase) may aid diagnosis.	None established by CDC.
Infectious TB 5-10	Prolonged recurrent fever, chronic cough, anorexia, fatigue, and weight loss.	Coughing blood from the lungs. Chronic Obstructive Pulmonary Disease, abnormal stretching and enlarging of the respiratory passages caused by mucus blockage, fluid in the lungs.	Average incubation period 21 weeks, 95% of cases will develop within 15-28 weeks.	Airborne route. Extended period of close contact.	Abnormal chest radiograph. Respiratory specimens smear or culture positive. Tuberculin Skin Test (TST) or Quantiferon®-TB Test positive. Symptoms based: combination of chronic cough (>2 weeks), weight loss, and fatigue.	Quantiferon®-TB Test.
Cholera 11-14	<20% of Cholera patients will show any symptoms before full onset of disease.	Copious, painless, watery diarrhea. Vomiting also occurs in most patients.	Short incubation period, from less than one day to five days.	Ingesting contaminated water or food; person-to-person transmission is rare.	Diagnosis is confirmed by identification of the organism in a stool specimen.	None established by CDC.
Smallpox 15-21	High fever, back pain, headaches, vomiting, malaise, and prostration.	Maculopapular rash that progresses to papules, then vesicles, and then pustules and scab lesions.	Incubation period averages about 12 to 14 days but can range from 7 to 17 days.	Spread by inhalation of air droplets or aerosols. Direct (within 6-7 feet) and fairly prolonged (approximately 3 hours) face-to-face contact is required to spread smallpox from one person to another.	Characteristic rash and symptoms (fever, abdominal pain, etc). Electron microscopic (EM) visualization. RT-PCR. Confirmation.	Close contact of case, virus found in throat during incubation.
Hemorrhagic Fever Viruses 22-24	Fever, aching muscles, dizziness, neck pain, stiffness, backache, headache, sore eyes and sensitivity to light. Nausea, vomiting, sore throat, diarrhea, and generalized abdominal pain. Liver enlargement.	Fast heart rate, enlarged lymph nodes, and a rash caused by bleeding into the skin. Bleeding in the mouth and throat, the upper bowel, and the gums. Hepatitis. Liver and kidney and pulmonary failure.	Ebola: 2-21 days. Length of incubation may depend on the mode of acquisition (Crimean-Congo HV): tick bite, 1 to 3 days, with a maximum of 9 days; infected blood or tissues is usually 5 to 6 days, with a documented maximum of 13 days.	Direct contact with blood or other infected tissues from livestock or tick bite. Human to human close contact.	After 6 days of illness, antibodies can be detected (IgG or IgM). Prior to that, virus must be isolated from blood or tissue specimens and grown in host cells. Viral DNA may also be detected in the blood.	Virus can be isolated from blood or tissue specimens in the first five days of illness, and grown in cell culture. Likely to find virus in throat swabs, nasal swabs, blood, lymph, and sputum/lungs.
Plague 25-31	Fever, chills, headache, malaise, aching muscles, nausea, and prostration. Bubonic plague: painful, swollen lymph nodes. Pneumonic plague: cough, breathing difficulties.	Bubonic: draining the site of the flea bite. Pneumonic plague: bloody sputum.	Bubonic: 2-6 days. Pneumonic: 2-4 days with range of 1-6 days.	Flea bites. Direct contact with infectious animals or other materials or inhalation of infective respiratory droplets. Ingestion.	The swollen gland called a "bubo." F1 Ag immunocapture ELISA. Culture lysed by specific bacteriophage.	None established by CDC. Bacteria likely found by throat swab or in lymph.

(continued on next page)

APPENDIX A. CDC DISEASE QUARANTINES

Disease / References	Symptoms in Early Stage (prodrome stage)	Symptoms for Full Blown Illness (fulminant stage)	Incubation Period (average and range for 95% of cases)	Mechanism of Contagiousness	Method for Diagnosis in Early Stage	Method for Diagnosis during Incubation
SARS 32-35	High fever, headache, body aches. Mild respiratory symptoms at the outset. About 10 percent to 20 percent of patients have diarrhea.	Dry cough. Most patients develop pneumonia.	Average is 4 days. 95% of cases will develop within 12 days.	Close person-to-person contact. Most readily transmitted by respiratory droplets. People occasionally may become infected by touching a surface with influenza virus on it and then touching their mouth, nose or eyes.	RT-PCR and ELISA antibody assays are the most commonly used. Isolation in cell culture, electron microscopy for CoV-like particles, and immunohistologic or in situ probe hybridization studies on tissue specimens (not recommended).	None established by CDC.
Yellow Fever 36-37	Fever, muscle pain (with prominent backache), headache, shivers, loss of appetite, nausea and/or vomiting.	Fever, relative slow heart beat, jaundice, renal failure, and hemorrhagic complications.	3-6 Days.	Mosquito bite. No recorded human to human transmission.	Blood tests (serology assays) can detect yellow fever antibodies.	None established by CDC.
Pandemic Influenza 38-41	Fever, headache, tiredness, cough, sore throat, runny or stuffy nose, body aches. Diarrhea and vomiting (among children).	Pneumonia, acute respiratory distress, respiratory failure, and life-threatening complications.	Typically 1–4 days, with an average of 2 days.	Person to person in respiratory droplets when people who are infected cough or sneeze. People occasionally may become infected by touching a surface with influenza virus on it and then touching their mouth, nose or eyes.	Immunofluorescence tests. Rapid antigen detection (ELISA), virus isolation and reverse transcription-polymerase chain reaction (RT-PCR). Embryonic egg culture (not recommended).	None established by CDC.

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APPENDIX B

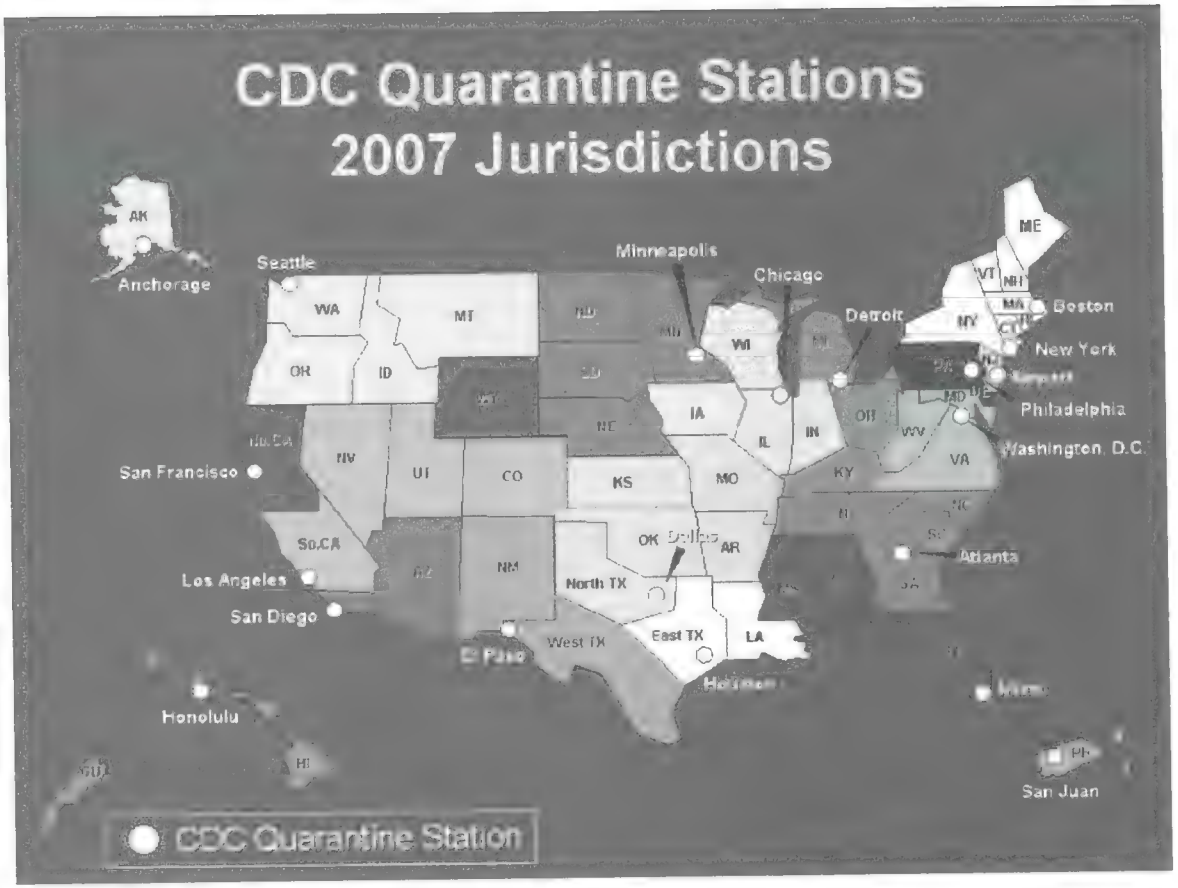
CDC Quarantine Station Jurisdictions and Contact Information

CDC Quarantine Station Jurisdictions and Contact Information

(All numbers operate with 24 hour access, unless an alternate number is provided. Confirm address for shipping non-FedEx parcels)

Quick Reference Guide

Quarantine Station	Daytime	After hours
Anchorage	(907) 271-6301	(907) 271-6301
Atlanta	(404) 639-1220	(404) 639-1220
Boston	(617) 561-5701	(617) 561-5701
Chicago	(773) 894-2960	(773) 894-2960
Dallas/Ft Worth	(972) 973-9256	(972) 973-9257
Detroit	(734) 955-6197	(734) 955-6197
El Paso	(915) 351-2930	(915) 543-2829
Honolulu	(808) 861-8530	(808) 861-8530
Houston	(281) 230-3874	(281) 230-3874
Los Angeles	(310) 215-2365	(310) 215-2365
Miami	(305) 526-2910	(305) 526-2910
Minneapolis	(612) 725-3005	(612) 725-3005
Newark	(973) 368-6200	(973) 368-6200
New York	(718) 553-1685	(718) 553-1685
Philadelphia	(215) 365-6401	(215) 365-6401
San Diego	(619) 692-5665	(877) 226-2784
San Francisco	(650) 876-2872	(650) 876-2872
San Juan	(787) 774-7812	(787) 774-7812
Seattle	(206) 553-4519	(206) 553-4519
Washington, DC	(703) 661-1320	(703) 661-1320



Shipping note: For shipping to quarantine stations using a delivery service other than FedEx (such as UPS, DHL or freight), confirm the correct shipping address prior to sending.

Time zones: All hours of operation are based on the local time of the station's geographical location.

CDC Quarantine Station Jurisdictions and Contact Information

(All numbers operate with 24 hour access, unless an alternate number is provided. Confirm address for shipping non-FedEx parcels)

Quarantine Station/Jurisdiction	Hours of Operation/Phone/FAX	Location/Inside deliveries (FedEx)	U.S. Mailing Address
Anchorage Quarantine Station **Jurisdiction:** All ports in Alaska.	Hours: 8:00 AM-4:30 PM, Mon-Fri **Ph: (907) 271-6301 (24 hour access)** Fax:(907) 271-6325	4600 Postmark Drive. Suite NC 206 North Terminal – C/O CBP Anchorage, Alaska 99502	4600 Postmark Drive, Suite NC 206 North Terminal – C/O CBP Anchorage, Alaska 99502
Atlanta Quarantine Station **Jurisdiction:** All ports in Georgia, North Carolina, South Carolina, and Tennessee.	Hours: 8:00 AM-8:00 PM, Mon-Fri **Ph: (404) 639-1220 (24 hour access)** Fax:(404) 639-1224	Hartsfield-Jackson International Airport Concourse E, Room E3-215 POB 45256 Atlanta, GA 30320	CDC Atlanta Quarantine Station P.O. Box 45256 Atlanta, GA 30320
Boston Quarantine Station **Jurisdiction:** All ports in Massachusetts, Maine, New Hampshire, and Rhode Island.	Hours: 8:00 AM-4:30 PM, Mon-Fri **Ph: (617) 561-5701 (24 hour access)** Fax: (617) 561-5708	500 Terminal E, 2nd floor Logan International Airport East Boston, MA 02128	500 Terminal E, 2nd floor Logan International Airport East Boston, MA 02128
Chicago Quarantine Station **Jurisdiction:** All ports in Illinois, Indiana, Iowa, and Wisconsin. Canadian pre-clearance port: Toronto.	Hours: 8:00 AM-8:00 PM, Mon-Fri 12:00 PM-8:00 PM, Sat, Sun, holidays **Ph: (773) 894-2960 (24 hour access)** Fax: (773) 894-2970	O'Hare International Airport International Terminal Number 5 U.S. Customs Hall Area, Lower Lvl. Chicago, IL 60666	O'Hare International Airport AMC O'Hare, POB 66012 Chicago, IL 60666-0012
Dallas/Ft Worth Quarantine Station **Jurisdiction:** All ports in Kansas, Missouri, Oklahoma, Arkansas and North Texas (Health Districts 1, 2 and 3)	Hours: 8:00 AM -4:30 PM, Mon-Fri Ph:(972)-973-9256 **Officer in Charge: (972) 973-9257 (24 hour access)** Medical Officers: (972) 973-9258 Fax:(972) 973-9259	CDC DFW Quarantine Station c/o Custom and Border Protection Terminal D- Arrivals Level Door # D23F159 DFW International Airport, TX 75261	CDC DFW Quarantine Station P.O. Box 612325 Dallas, TX 75261
Detroit Quarantine Station **Jurisdiction:** All ports in Michigan, Kentucky, and Ohio.	Hours: 8:00 AM-4:30 PM, Mon-Fri **Ph: (734) 955-6197 (24 hour access)** Fax:(734) 955-7790	CDC Detroit Quarantine Station 2613 World Gateway Place Detroit Metro Airport McNamara Terminal, Bldg. 830 Detroit, MI 48242	2613 World Gateway Place McNamara Terminal, Bldg. 830 Detroit, MI 48242
El Paso Quarantine Station **Jurisdiction:** All ports in West Texas (Health Districts 8, 9, 10, and 11) and New Mexico, the U.S.-Mexico border in both states.	Hours: 8:00 AM-5:00 PM, Mon-Fri Ph:(915) 351-2930 **Ph: (915) 543-2829 (24 hour answering service)** Fax: (915) 351-2438	700 E. San Antonio Avenue Suite B-402 El Paso, TX 79901	CDC El Paso Quarantine Station Richard C. White Federal Building 700 E. San Antonio Ave Ste B-402 El Paso, TX 79901

(continued on next page)

CDC Quarantine Station Jurisdictions and Contact Information

(All numbers operate with 24 hour access, unless an alternate number is provided. Confirm address for shipping non-FedEx parcels)

Honolulu Quarantine Station **Jurisdiction:** All ports in Hawaii, Guam, and Pacific Trust Territories.	Hours: 6:00 AM-2:00 PM, Mon-Fri **Ph: (808) 861-8530 (24 hour access)** Fax: (808) 861-8532	Honolulu International Airport International Arrivals 2nd Level, Ewa End Honolulu, HI 96819	Honolulu International Airport 300 Rodgers Blvd., #67 Honolulu, HI 96819-1897
Houston Quarantine Station **Jurisdiction:** All ports in East Texas (Health Districts 4, 5, 6 and 7) and Louisiana.	Hours: 9:00 AM-5:30 PM, Mon-Fri **Ph: (281) 230-3874 (24 hour access)** Fax: (281) 230-3879	George Bush Intercontinental Airport (IAH) 3870 North Terminal Road C/O CBP, International Arrivals US Public Health Service, IA2.0833	CDC Houston Quarantine Station POB 60366 Houston, TX 77205
Los Angeles Quarantine Station **Jurisdiction:** All ports in Southern California (excluding the US-Mexico border counties), Nevada, Utah and Colorado. Southern California counties include Los Angeles, Orange, San Bernardino, Riverside, Ventura, Santa Barbara, San Luis Obispo, Inyo and Kern.	Hours: 7:00 AM-4:00 PM, Mon-Fri 8:00 AM-4:00 PM, Sat, Sun, holidays **Ph: (310) 215-2365 (24 hour access)** Fax: (310) 215-2285 Fax: (310) 348-6481	Houston, Texas 77032 **Heavy (over 10 lbs.) Deliveries** Tom Bradley International Terminal 380 World Way Room 1428 (Southside FIS area) Los Angeles, CA 90045 **Light (under 10 lbs.) Deliveries** Tom Bradley Int'l Airport Public Information Office Bureau of Customs and Border Protection, Departure Level Los Angeles, CA 90045	CDC Los Angeles Quarantine Station 380 World Way Box N-19 Los Angeles, CA 90045 (envelopes only)
Miami Quarantine Station **Jurisdiction:** All ports in Florida, Alabama and Mississippi. Also, pre-clearanceports in the Bahamas.	Hours: 8:00 AM-4:30 PM, Mon-Fri 8:00 AM-4:00 PM, Sat, Sun, holidays **Ph:(305) 526-2910 (24 hour access)** Fax: (305) 526-2798	Miami International Airport Terminal Bldg.,3rd Floor Concourse E Miami, FL 33159	Miami International Airport PO Box 996488 Miami, FL 33299-6488
Minneapolis Quarantine Station **Jurisdiction:** All ports in Minnesota, Nebraska, North Dakota and South Dakota.	Hours: 8:00 AM-4:30 PM, Mon-Fri **Ph: (612) 725-3005 (24 hour access)** Fax:(612) 725-3006	Minneapolis-St. Paul International Airport Lindberg Terminal C/O CBP 4300 Glumack Drive St. Paul, MN 55111-301	CDC Minneapolis Quarantine Station C/O CBP, HHH Terminal 7150 Humphrey Drive, Ste. 2168 Minneapolis, MN 55450
Newark Quarantine Station **Jurisdiction:** All ports in New Jersey.	Hours: 9:00 AM-5:30 PM, Mon-Fri **Ph: (973) 368-6200 (24 hour access)** Fax:(973) 368-6204	CDC Newark Quarantine Station Terminal B – 2nd floor CBP Ship's Office International Arrivals Newark Liberty International Airport, NJ 07114	CDC Newark Quarantine Station 52 Terminal B Newark Liberty International Airport, Newark, NJ 07114

CDC Quarantine Station Jurisdictions and Contact Information

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New York Quarantine Station **Jurisdiction:** All ports in New York, Connecticut, and Vermont. Pre-clearance ports: Montreal, Shannon and Dublin.	Hours: 8:00 AM-6:00 PM, Mon-Fri 10:00 AM-6:00 PM, Sat, Sun, holidays **Ph: (718) 553-1685 (24 hour access)** Fax: (718) 553-1524	JFK International Airport Room 219.016 Terminal 4 (E) Jamaica, NY 11430-1081	CDC New York Quarantine Station JFK International Airport Terminal 4, Room 219.016 2nd Floor, East Concourse Jamaica, NY 11430-1081
Philadelphia Quarantine Station **Jurisdiction:** All ports in Pennsylvania and Delaware	Hours: 8:30 AM – 5:00 PM, Mon-Fri **Ph: (215) 365-6401 (24 hour access)** Fax: (215) 365-5419 Contact staff before sending a FAX	CDC Philadelphia Quarantine Station c/o Customs and Border Protection Philadelphia International Airport "A" West, 3rd fl, International Arrivals Philadelphia, PA 19153	CDC Philadelphia Quarantine Station c/o Customs and Border Protection Philadelphia International Airport "A" West, 3rd fl, International Arrivals Philadelphia, PA 19153
San Diego Quarantine Station **Jurisdiction:** All ports in Arizona, San Diego and Imperial counties of California and the U.S. – Mexico border for both states.	Hours: 8:30 AM-5:00 PM, Mon-Fri Ph: (619) 692-5665 (Officer in Charge) **Ph: (877) 226-2784 (After hours pager)** Fax: (619) 692-8821	CDC San Diego Quarantine Station, MS P575 3851 Rosecrans St., Suite #715 San Diego, CA 92110-3115	CDC San Diego Quarantine Station, MS P575 3851 Rosecrans St., Suite #715 San Diego, CA 92110-3115
San Francisco Quarantine Station **Jurisdiction:** All ports in Central and Northern California (46 counties) and Wyoming.	Hours: 8:00 AM-5:00 PM, Mon-Fri **Ph: (650) 876-2872 (24 hour access)** Fax: (650) 876-2796	San Francisco International Airport International Arrival Area Terminal G – 2nd Level Federal Inspections Area San Francisco, CA 94128	San Francisco International Airport PO Box 280548 SFIA San Francisco, CA 94128-0548
San Juan Quarantine Station **Jurisdiction:** All ports in Puerto Rico and the U.S. Virgin Islands.	Hours: 8:00 AM-5:30 PM, Mon-Fri Ph: (787) 253-7880 **Ph: (787) 774-7812 (24-hour line)** Fax: (787) 253-4671	CDC San Juan Quarantine Station Luis Munoz Marin International Terminal D 3rd Fl. FIS Area Carolina, PR 00979	CDC San Juan Quarantine Station Luis Munoz Marin International Airport Post Office P.O. Box 37197 San Juan, PR 00937-0197
Seattle Quarantine Station **Jurisdiction:** All ports in Washington, Idaho, Montana, and Oregon. Canadian pre clearance ports: Edmonton, Calgary, Vancouver, and Victoria.	7:30 AM-4:00 PM, Mon-Fri **Ph: (206) 553-4519 (24 hour access)** Fax: (206) 553-0855	Seattle-Tacoma International Airport Room S-2067 Seattle, WA 98158-1250	CDC Seattle Quarantine Station C/O U.S. Customs & Border Protection 2580 South 156th Street Bldg. A, Room 101 Seattle, WA 98158-1250
Washington Quarantine Station **Jurisdiction:** All ports in Washington DC, Maryland, Virginia, and West Virginia.	8:00 AM-4:30 PM, Mon-Fri **Ph: (703) 661-1320 (24 hour access)** Fax: (703) 661-5095	*Include Recipient's Name and Phone #* CDC c/o FedEx 23723 Air Freight Lane Dulles, VA 20166	Dulles International Airport P.O. Box 17087 Washington, DC 20041

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

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